

1 What is claimed is:

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3 1. An apparatus for a mass spectrometer, wherein said apparatus
4 comprises:

5 at least one pair of conducting rods;

6 at least one capping electrode;

7 means for applying voltages to said conducting rods;

8 and

9 means for applying voltages to said capping electrodes;

10 wherein said conducting rods are aligned in parallel,
11 wherein said at least one capping electrode bounds said
12 conducting rods, and wherein said at least one capping electrode
13 comprises at least one opening.
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15 2. An apparatus according to claim 1, wherein said at least one
16 capping electrode comprises a plurality of openings.
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18 3. An apparatus according to claim 2, wherein at least one of
19 said openings accepts sample ions.
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21 4. An apparatus according to claim 2, wherein at least one of
22 said openings provides access through said ion guide for a laser
23 beam to ionize a sample material.

1 5. An apparatus according to claim 1, wherein said ion guide
2 focuses sample ions.

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4 6. An apparatus according to claim 1, wherein said apparatus
5 traps sample ions therein for ion selection.

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7 7. An apparatus according to claim 1, wherein said apparatus
8 traps sample ions therein for ion fragmentation.

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10 8. An apparatus according to claim 1, wherein each said
11 conducting rod is positioned equidistant from a vertical axis.

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13 9. An apparatus according to claim 1, wherein said apparatus
14 transfers sample ions from an ionization region to a mass
15 analysis region.

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17 10. An apparatus according to claim 9, wherein said mass
18 analysis region comprises a time-of-flight mass analyzer.

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20 11. An apparatus according to claim 9, wherein said mass
21 analysis region comprises a quadrupole mass analyzer.

12. An apparatus according to claim 9, wherein said mass analysis region comprises a quadrupole ion trap mass analyzer.

13. An apparatus according to claim 9, wherein said mass analysis region comprises a Fourier transform ion cyclotron resonance mass analyzer.

14. An apparatus according to claim 9, wherein said mass analysis region comprises an ion mobility mass analyzer.

15. An apparatus according to claim 9, wherein said ionization region comprises an ion production means.

16. An apparatus according to claim 15, wherein said ion production means is atmospheric pressure chemical ionization.

17. An apparatus according to claim 15, wherein said ion production means is electrospray ionization.

18. An apparatus according to claim 15, wherein said ion production means is matrix-assisted laser desorption/ionization.

1 19. An apparatus according to claim 15, wherein said ion
2 production means is secondary ionization.

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4 20. An apparatus according to claim 15, wherein said ion
5 production means is fast atom bombardment ionization.

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7 21. An apparatus for analyzing chemical species, wherein said
8 apparatus comprises:

9 at least one ion production region;

10 an ion guide, said ion guide having a plurality of
11 conducting electrodes and at least one capping
12 electrode;

13 means for applying voltages to said ion guide;

14 a plurality of vacuum stages; and

15 an analysis region;

16 wherein said ion guide accepts sample ions from any said ion
17 production region, and wherein said ion guide transfers said
18 sample ions to said analysis region.

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20 22. An apparatus according to claim 21, wherein at least one of
21 said capping electrodes comprises at least one opening.

1 23. An apparatus according to claim 22, wherein at least one of
2 said openings accepts said sample ions from at least one said
3 ionization region.

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5 24. An apparatus according to claim 22, wherein at least one of
6 said openings provides access through said ion guide for a laser
7 beam to ionize a sample material.

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9 25. An apparatus according to claim 21, wherein said ion guide
10 focuses sample ions.

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12 26. An apparatus according to claim 21, wherein said ion guide
13 traps sample ions therein for ion selection.

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15 27. An apparatus according to claim 21, wherein said ion guide
16 traps sample ions therein for ion fragmentation.

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18 28. An apparatus according to claim 21, wherein each said
19 conducting rod is positioned equidistant from a vertical axis.

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21 29. An apparatus according to claim 21, wherein said analysis
22 region comprises a time-of-flight mass analyzer.

1 30. An apparatus according to claim 21, wherein said analysis
2 region comprises an ion mobility analyzer.
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4 31. An apparatus according to claim 21, wherein said analysis
5 region comprises a quadrupole mass analyzer.
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7 32. An apparatus according to claim 21, wherein said analysis
8 region comprises a quadrupole ion trap mass analyzer.
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10 33. An apparatus according to claim 21, wherein said analysis
11 region comprises a Fourier transform ion cyclotron resonance mass
12 analyzer.
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14 34. An apparatus according to claim 21, wherein said ion
15 production region comprises an ion production means.
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17 35. An apparatus according to claim 21, wherein said ion
18 production means is electrospray ionization.
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20 36. An apparatus according to claim 21, wherein said ion
21 production means is atmospheric pressure chemical ionization.
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1 37. An apparatus according to claim 21, wherein said ion
2 production means is matrix-assisted laser desorption/ionization.
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4 38. An apparatus according to claim 21, wherein said ion
5 production means is glow discharge.
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7 39. An apparatus according to claim 21, wherein said ion
8 production means is secondary ionization.
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10 40. An apparatus according to claim 21, wherein said ion
11 production means is fast atom bombardment.
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1 41. A method for analyzing chemical species in a mass
2 spectrometer comprising an ion production means, at least one
3 multipole ion guide, a vacuum system, and a mass analyzer, said
4 method comprising the steps of:

- 5 (a) producing ions in an ion production region;
6 (b) introducing said ions into an ion guide, said ion guide
7 comprising a plurality of conducting rods and at least
8 one capping electrode;
9 (c) applying a first potential to said conducting rods such
10 that said ions move to a central axis of said ion
11 guide;
12 (d) transferring said ions from said ion guide into a mass
13 analysis region; and
14 (e) conducting mass analysis of said ions.
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16 42. A method according to claim 41, wherein said ions are
17 produced from a plurality of said ion production means.
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19 43. A method according to claim 41, wherein gas phase chemical
20 reactions occur within the ion guide.
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22 44. A method according to claim 41, wherein ion selection occurs
23 within said ion guide.

1 45. A method according to claim 41, wherein ion fragmentation
2 occurs within said ion guide.
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4 46. A method according to claim 41, wherein said ions are
5 transferred from said ion guide into a second ion guide before
6 entering said mass analysis region.
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8 47. A method according to claim 41, wherein said method further
9 comprises the step of:

- 10 (d) applying a second potential to said capping electrode
11 to create an electric field to trap said ions
12 within said ion guide.
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